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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/695,843
Filing Date: October 29, 2003
Appellant(s): COLLINS ET AL.

Paul John Parins
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 3, 2006 appealing from the Office action mailed February 3, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 2003/0075555	MEKIAS	4-2003
US 6,383,289	DESIMONE et al.	5-2002
US 6,494,953	HAYES et al.	12-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Mekias (US 2003/0075555, submitted by the applicant).

In re claim 1, Mekias, in Fig. 1~4 and related text, teach a spin-coating system (paragraph [0023]) comprising a supply of process solution in fluid 12 (paragraph [0029]) communication with a dispenser 30 (Fig.2) through a dispense line 6 (paragraph [0029]), and a pressure sensor 44 (Fig.4 and paragraphs [0023] and [0035]) that measures pressure of the process solution in the dispense line 6 at a time related to a step of dispensing the process solution, to control timing of a subsequent spin-coating process step.

In re claim 2, Mekias teaches that the pressure sensor comprises a pressure transducer (paragraph [0023]).

In re claim 3, Mekias, in Fig.3, teach that a dispense valve 22 is between the supply of process solution 32 and the dispenser 30, and the pressure sensor 44 is between the dispense valve 22 and the dispenser 30, which is inside the process chamber 8, because Mekias discloses that a dispense head (i.e. the dispenser) is inside a processing chamber 8 (paragraph [0023]).

In re claim 4, Mekias inherently teach that the pressure sensor 44 detects a beginning or end of process solution being dispensed from the dispenser 30.

In re claim 5, Mekias teaches comprising a control system (i.e. a high-precision electronic feedback control system (paragraph [0021]) for controlling a spin coating process, wherein the pressure sensor 44 detects a beginning or end of process solution being dispensed

from the dispenser 30 and the pressure sensor send a signal to the control system at a detected beginning or at a detected end of the process solution dispense (paragraph [0022]).

In re claims 6 and 8, Mekias teaches that the solution is a photoresist solution (paragraph [0025]), and the pressure sensor signals the control system at a detected end of the process solution dispense.

In re claim 7, Mekias teaches that the solution is a developer solution (paragraph [0025]), and the control pressure sensor 44 signals the control system at a detected end of the developer solution dispense.

Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeSimone et al .(US 6,383,289) in view of Hayes et al. (US 6,494,953).

In re claim 9, DeSimone et al. teach a spin-coating system comprising:

- a turntable 13 to support and rotate a substrate 12(Fig.1);
- a dispenser 17 positioning above the substrate 12;
- a supply of process solution in fluid communication with the dispenser 17 through a dispense line 31 (Fig.1);
- a pressure sensor 50 that measures pressure of the process solution; and
- a process control system (i.e. *a controller, col. 6, lines 24-25*) that controls application of the process solution to the substrate 12, the process control system being programmed to interrupt serial control to execute a process command.

DeSimone et al. is silent as to the dispenser being moveable between a dispensing position and a non-dispensing position.

Hayes et al., in an analogous art, teach using a dispenser comprising a dispensing nozzle 76 and a dispensing line 14 (Fig.3), which is moveable between a dispensing position (i.e. the position above the substrate 15) and a non-dispensing position (i.e. the position above the solvent bath 18), wherein the dispenser is rinsed in the solvent bath 18 (Fig.1 and col. 3, lines 46-49).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to combine DeSimone et al. with Hayes et al. so that the dispenser can be used for spin coating at the dispensing position and be cleaned at the non-dispensing position (col. 3, lines 46-49, Hayes et al.).

In re claim 10, DeSimone et al. teach that the system comprises a dispense valve 32 between the supply of process solution and the dispenser 17, the pressure sensor 50 measures pressure of the process solution in the disperse line, the pressure sensor 50 is between the dispense valve and the dispenser 17.

In re claims 11 and 15, DeSimone et al. teach that the solution is a photoresist solution (col. 4, line 32).

In re claim 12, DeSimonde et al. inherently teach that the pressure sensor 50 sends a signal to the control system (i.e. a controller, col. 6, lines 24-25) at the beginning or at the end of dispense of the process solution, and the control system interrupts control of process (col.3, lines 25-34).

In re claim 13, DeSimonde et al. also teach the claimed limitations, as stated in the rejection against claims 11 and 12.

In re claim 14, the teachings of DeSimonde et al. is illustrative rather than restricted to the photoresist solution (col. 4, lines 28-38 and col. 6, lines 35-36). One of the ordinary skill in the art would have been motivated to apply the teachings of DeSimonde et al. to spin-coat a

developer solution for a expectation of success, i.e. using the pressure sensor 50 of DeSimonde et al. capable of sending a signal to the controller at the start of the developer solution dispense.

(10) Response to Argument

In re claims 1-8, Appellant asserted that "Mekias does not teach a spin-coating system that includes a pressure sensor that measures the pressure of a process solution in a dispense line at time related to solution dispense to control the timing of a subsequent spin-coating process step" (in the middle of page 10 of the arguments) because pressure sensors in Mekias are utilized to " measure the pressure of a process fluid to control the process fluid pressure in the Mekias pump via feedback control." (Last paragraph of page 10 of the arguments) Appellant contends that the feedback control system may not able to control the timing of a subsequent spin-coating process step." To reinforce this position, Appellant argued that the feedback control system is adapted to measure an output value (e.g. fluid pressure) of a process, to compare the measured output value to an expected value, to make a decision based on the comparison, and thus to actuate a device to control an input parameter (e.g. fluid pressure), dependent upon the decision. (last paragraph of page 10 of the arguments) Therefore, Appellant concluded that 'depending on the decision made, a device at an " input" point may be actuated to control the process fluid pressure, **not** necessary to control the timing of a subsequent spin-coating process steps.' (first paragraph of page 11 of the arguments)

In response to the foregoing arguments, Mekias teach a spin-coating system (i.e. a dispensing apparatus, paragraph [0005]) that includes one or more **pressure sensors** in pressure regulating system 44 to **measure pressure of the process solution** in a dispensing line for

feedback control process solution (paragraph [0023]) in combination with controlling the **timing** of opening and closing of inlet and outlet valves of the process chamber (paragraphs [0022] and [0018]). By properly controlling the **timing** of opening and closing of inlet and outlet valves, the spin-coating system can precisely control the **timing of subsequent spin-coating process steps**, e.g. open the outlet valve to dispense process solution through a dispense line; subsequently close the outlet valve to stop dispensing; and subsequently open the inlet valve to refill the process solution into the dispensing line.

Regarding the feedback control system is concerned, it is capable of not only control the input and output parameters (i.e. fluid pressure) (paragraph [0022], Mekias) but **also control the timing of subsequent processing steps**, as stated previously. This is **because** the feedback control system can manipulate the timing of opening and closing of inlet and outlet valves (paragraphs [0022] and [0018], Mekias), which in turn would control the timing of **when** to start dispensing the process fluid; **subsequently** to stop dispensing the process solution; and **subsequently** resume dispensing the process fluid, as desired, i.e. to control timing of a subsequent spin-coating process step(s). In fact, the attached document (i.e. "Process dynamics, modeling and control", Babatunde A. Ogunnaike) that was submitted by the Appellant is also support examiner's position. The document discloses that the feedback control system is implanted in a process to determine what and when action(s) need to be taken in regulating process behavior. (page 18, first paragraph) Accordingly, the **pressure sensor** having the function of feedback control as taught by Mekias is **capable** of **measuring pressure** of the process solution **and controlling timing of a subsequent spin-coating process step(s).**

In re claims 9-15, Appellant maintained that "DeSimone et al. fail to teach a process control system that includes interrupting serial control to execute a process command, especially in the context of controlling the application of a process solution" (lines 3-5 in page 12 of the arguments), wherein the process solution refers to carbon dioxide liquid (lines 9-10 in page 12 of the arguments) or any other process solution (fifth paragraph, lines 3-4, in page 12 of the arguments).

In response to the foregoing arguments, DeSimone et al teach a spin-coating system (abstract) comprising a process control system comprising a controller (i.e. programmable computer, col. 6, lines 24-26) that controls application of the process solution to the substrate, i.e. the process control system is programmed by the programmable computer to execute acts of applying the process solution (i.e. carbon dioxide liquid) on a top surface of a substrate (col. 3, lines 50-51). The process control system can then be used to **interrupt serial control to execute a process command**, i.e. using the programmable computer to manipulate a robotic arm to **interrupt** the spin-coating on a first substrate **and then** exchanging the first substrate with a second substrate (col. 6, lines 21-30) **and then** continue spin-coating the process solution on the second substrate in a **sequential-order manner (i.e. a serial control manner).** Therefore, DeSimone et al **do** teach **all** limitations, including " a process control system that controls application of the process solution to the substrate, the process control system being programmed to interrupt serial control to execute a process command", with the **exception** that the dispenser is **moveable** between a dispensing position and a non-dispensing position.

To remedy the foregoing deficiency in DeSimone et al, Hayes reference is used. Hayes et al., in an analogous art of spin-coating system, disclose a **moveable dispenser 10** (col. 6, lines

24-27 and lines 32-34) comprising a dispensing line 12, a solvent line 16, a fluid channel 48 (Figs.1 and 6) and nozzles 76 (Fig.2 and 6). The **moveable dispenser** can move between the substrate 15 and the solvent bath 18 (Fig.1), wherein the substrate 15 is equivalent to the "dispensing position" (i.e. the location for dispensing the process solution, col. 6, lines 24-31) and the solvent bath 18 is equivalent to the "non-dispensing position" (i.e. the location for stop dispensing the process solution and thus for cleaning excess coating material off the dispenser between coating evolutions and rinsing the fluid residue off the dispenser, col. 3, lines 46-49, col. 5, lines 42-44 and col. 6, lines 33-41).

By modifying the stationary dispenser of DeSimone et al with the **moveable dispenser** of Hayes et al., the dispenser can be used for spin-coating at the dispensing position and be cleaned at the non-dispensing position (col. 3, lines 46-49, Hayes et al.) so that the dispenser would not be plugged by the excess coating material.

Finally Appellant argued that "Hayes et al. fails to cure the deficiencies of the DeSimone et al. reference" because "Hayes et al fail to teach, motivate, or suggests a process control system that controls application of a process solution and includes interrupting serial control to execute a process command." (Second paragraph of page 13 of the arguments)

Contrary to the argument that "Hayes et al. fails to cure the deficiencies of the DeSimone et al. reference", one of the ordinary skill in the art would have been motivated to replace the stationary dispenser of DeSimone et al. with the moveable dispenser of Hayes et al. to clean excess coating material off the dispenser between coating evolutions (col. 3, lines 46-49, col. 5, lines 42-44, Hayes et al.) and to rinse the fluid residue off the dispenser (col. 6, lines 33-41, Hayes et al.).

In response to Appellant's arguments that "Hayes et al fail to teach, motivate, or suggests a process control system that controls application of a process solution and includes interrupting serial control to execute a process command", one cannot against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In fact, Hayes et al **do** teach a process control system that is capable of applying a process solution onto the substrate 15 via the moveable dispenser 10 (Fig.1); subsequently interrupting the act of dispensing to move the moveable dispenser 10 away the substrate 15 (col. 6, lines 32-34) to clean the dispenser 10 in the solvent bath 18 (Fig.1) and subsequently resume the act of dispensing by moving the moveable dispenser 10 back to above the substrate 15 in a **sequential- order control** manner (i.e. **serial control**).

In conclusions, Mekias reference alone reads the current invention and DeSimone et al. in view of Hayes et al. as a whole has suggested the reasonable motivation and thus the obviousness of making the combination.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Hsien Ming Lee

August 23, 2006

Conferees:

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